LABORATORY SIMULATION OF PHOTOCHEMISTRY ON TITAN AND COMPARISON WITH AVAILABLE HUYGENS DATA

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Solar UV irradiation is the principal energy source driving the chemistry in Titan's atmosphere. We have investigated the photochemical reactions occurring in Titan's atmosphere in a flow reactor using the 185 and 254 nm UV light (Tran et al. 2003a). The irradiation of a gas mixture containing acetylene, ethylene, hydrogen cyanide, cyanoacetylene, methane, hydrogen and nitrogen generated volatiles and solid material as an analog of Titan's haze. The complex refractive index of the solid material was determined and compared with the corresponding refractive index derived from the optical data on Titan's haze from Voyager 1 (Tran et al, 2003b). The objectives of the present study are the determination the structure of the volatile reaction products and reaction pathways leading to them. Quantum yields for the loss of reactants and the formation of volatile products were determined from the rates measured by gas chromatographic analysis. More than 120 volatile compounds were detected by GC/MS (Ferris et al. 2005) (Tran et al, 2005). The similarities and difference in the products obtained photochemically and by plasma discharges will be discussed along with comparison with the data available from the Huygens probe. Tran B. N., J. P. Ferris and J. J. Chera, 2003a, The photochemical formation of a Titan haze analog. Structural analysis by X-ray photoelectron and infrared spectroscopy, Icarus, 162, 114-124. Tran B. N., J. C. Joseph, J. P. Ferris, P. D. Persans and J. J. Chera, 2003b, Simulation of Titan haze formation using a photochemical flow reactor: The Optical constants of the polymer., Icarus, 165, 379-390. Ferris, James, Buu Tran, Jeffrey Joseph, Veronique Vuitton, Robert Briggs, and Michael Force The role of photochemistry in Titan's atmospheric chemistry, 2005, James Ferris, Buu Tran, Jeffrey Joseph, Veronique Vuitton, Robert Briggs, and Michael Force, Adv. Space Res. In press. Tran, Buu Jeffrey C. Joseph, Michael Force, Robert C. Briggs, Veronique Vuitton and James P. Ferris Photochemical processes on Titan. Irradiation of mixtures of gases that simulate Titan's atmosphere, 2005, Buu Tran, Jeffrey C. Joseph, Michael Force, Robert C. Briggs, Veronique Vuitton and James P. Ferris, Icarus, in press.